Executive Summary:

Washington Park Condominiums is an 8-story multi-use retail and residential building located in Mt. Lebanon, Pennsylvania. The primary structural system employed within the building is a composite steel joist system, supported by steel moment frame system. These systems are adequate in carrying the gravity and lateral loads of the building. The past three technical reports have taken a detailed look at the current structural system of the building as well as exploring various other floor systems that could possibly be used as an alternative to the current design. These same technical reports have brought to light the fact that the current structural system may not be the most efficient or cost effective solution available for design. Because of this a depth study and two coinciding breadth studies will be completed as a means of research and analysis, these studies are planned as follows:

Depth Study: Structural System Redesign

First, thorough research will be conducted on different high rise condominium buildings throughout the Mid-Atlantic region to see how the structural systems for those buildings were implemented. The focus of the research will be centered on concrete structural systems and how they perform under given gravity and lateral loading conditions. Next, the new structural design that will be studied is a two way flat plate concrete slab system with cast in place concrete columns. The design will take into account the fact that the slab thickness needs to be minimized within the design so the ceiling height within the apartments can be maximized. Moreover, this system should be able to use the same column grid as the steel structure with possibly a few changes near the elevator shafts and stairways. The foundation for the building will also need to be redesigned to handle the additional load on the building. Moreover, concrete shear walls will be designed to carry the lateral loads on the building. These shear walls can be placed around the elevator shafts and staircases located within the interior of the building causing minimal interference with the architectural aspects of the floor plan.

Breadth Study 1: Structural System Acoustical Performance

The different spaces that are included in the building lead to the possibility of sound transmission between floors caused by the close proximity of busy retail spaces and the private condominiums. Also, the amount of unwanted vibration experienced by tenants caused by HVAC equipment as well as the elevator equipment is a concern. This particular concern was expressed by the owner of the building during a meeting with him before the beginning of the project. This study will be conducted using the current structural steel system as well as the new flat plate concrete system. The two systems will be acoustically analyzed using decibel levels as well as STC and sound transmission values so that the results can be compared and presented to the owner. Ultimately, a modification of the wall and/or ceiling cavities may need to be done to suffice the acoustical requirements of the owner and the tenants.

Breadth Study 2: Architectural Detailing

As a result of the structural system of Washington Park Condominiums being changed from a composite steel joist system to a flat plate concrete slab system, the architectural details will also need to be modified. More specifically, electrical, mechanical and plumbing systems will need to be modified so that they will fit in with the new ceiling cavity and the new structural system. These systems are the most important systems to the patrons of the building and will need to be adapted in a way that doesn't impact the individual living spaces. A comparison between the details provided by the architect and the details produced for this study will then be compared for ease of construction, impact of living space and ultimately cost.